

A Determination of the Salient Attributes of Internet Payment Systems

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Abstract

Market, technological and legal developments have contributed to a surge of innovation and change in payment systems in recent years, including the development of new means of making payments and the alteration of existing ones. However, many of the recent offerings have failed to gain traction in the e-Commerce marketplace for a variety of reasons. To understand the reasons for this it is necessary to identify the characteristics and services of payment systems in general, and then to determine the role they play in facilitating the more widespread adoption and diffusion of Internet payment systems in particular. This study examines both practitioner and academic literature related to payment systems, firstly, to develop a comprehensive list of their technical and systemic features, and then, using experts in the field, to categorize and consolidate them within a set of salient attributes. These attributes will then be used to study online merchants and customers and their perceptions of, and preferences towards, different Internet payment instruments.

1. Introduction

Both the global reach and interconnectivity of the Internet have spawned new business models and radically transformed existing ones [1], with electronic payments systems forming a critical component within this economy. The rapid rise and adoption of the Internet as a communications medium and channel for commerce has also served as a catalyst for the development of innovative payment instruments and payment protocols to facilitate the completion of business transactions over the Internet.

The payment market is closely related to the improvements in ICT infrastructure and significant advances over traditional means of payments can also be offered [2]. As a consequence the electronic payments market is constantly developing and customers are being offered new payment services or new ways of using existing payment instruments [3]. Benefits such as improved processing efficiency have the potential to significantly

increase functionality and reduce transaction costs. However, the speed with which any new payment instrument is eventually adopted depends, to a large extent, on the perceptions of the distributions of risks, costs and benefits of the market participants. Several authors have suggested that to gain widespread use, innovative payment systems must represent considerable advantage over existing mechanisms and successfully address concerns over such issues as privacy, security and convenience [4], and cost-effectiveness and flexibility [5].

However, many of those that have emerged in recent years (for example, SET, Beenz, CyberCash, Cybercent, Cybercoin, Digicash, eCharge, FirstVirtual, Flooz, and MicroMint) have had to exit the market because they had failed to address the commercial requirements of both consumers [6] and merchants. Concerns related to their stability and risks stemming from their availability and use have also contributed to their demise [7]. While Burns [8] argued that e-Commerce growth would be hindered without new payment systems, some of the systems that have appeared on the market since were accompanied by exaggerated claims and unrealistic expectations or were largely inappropriate for the existing and emerging business models [7, 9].

For online merchants and customers to be able to identify payment methods appropriate for their business models they would need to pursue strategies that would assess a number of factors. Payment systems are perceived to be composed of different levels of attributes and characteristics. For example, some payment systems might be considered more user-friendly than others, some more widely accepted than others, and some more secure than others. The relative utility of the attributes therefore plays a significant part in determining the successful adoption of a payment system.

There is a wide variation in the adoption (by merchants) and usage (by consumers) of online

payment systems for purchases of goods and services over the Internet, and an understanding of the complex set of issues involved will provide guidance to Australian stakeholders attempting to promote, offer, implement or use products that fit market requirements. The next section identifies these factors from a wide variety of literature and practitioner sources.

2. Literature Review

Several studies have analysed the general properties of payment methods and have attempted to classify and provide descriptions of their characteristics [10-19].

Many of them have described the features of payment systems, mainly taking a technological perspective [20, 21]. However, other factors also determine the success or failure of payment systems and not all of them are technical in nature. Technical excellence and successful implementation alone do not guarantee widespread adoption. Customer and merchant acceptance also depends on many user-related and market-related issues which the developers of a payment system need to consider.

Therefore, to better understand how payment systems are perceived by the various stakeholders and the features that impact on them, it is essential that all these aspects be considered for a more comprehensive understanding of the problems and challenges facing payment systems. The characteristics that describe these systems can be defined from various points of view that include user-related, technical, market, legal and other categorizations [18].

When users interact with a payment system they are directly influenced by certain characteristics of the system, typically ones such as ease of use, trust and cost, and indirectly influenced by those that are generally transparent to them. Many of the technology related characteristics like scalability, divisibility, interoperability and encryption for example are not immediately obvious and usually transparent to the user. In many cases users have little in-depth knowledge or direct experience with them. Much of their attitudes in this area are based on assumptions usually obtained from second hand sources, such as the media and other people's experiences.

3. Research Design

A comprehensive literature review was conducted to identify candidate attributes, features and services of payment systems (see Table 1 and Table 2). It must be pointed out that not all the characteristics identified here are necessarily found to the same degree in all payment systems, if at all. Some of these characteristics, like anonymity, are more important in some communities, or for certain kinds of transactions, than they are in other communities [18].

4. Development of the Salient Attributes

In attempting to obtain an understanding of their perceptions and preferences of alternative payment systems it would be impractical to subject customers and merchants to a list of attributes as fine grained as the ones discussed above. It is also highly unlikely that users would be in a position to provide useful insight at this level. Also, certain of the attributes discussed can overlap with each other. For example, authentication may be seen as a security solution that poses as a risk issue while at the same time impacting on ease of use.

Table 1: Attribute Definitions

<p>Security. This relates to the <i>privacy</i> of the consumer, <i>integrity</i> of the payment transaction, <i>authentication</i> of the parties engaged in the transaction and <i>non-repudiation</i> of transactions. Also associated with security is the degree to which a payment system is vulnerable to fraud and fraudulent activity, that is, its <i>fraud susceptibility</i>.</p> <p>Reliability. Reliability concerns how well the system maintains its service and service quality, often measured by the number of failures that occur in a given time period.</p> <p>Anonymity. There are instances when a user would prefer not to be identified through the money that they spend, wishing to remain anonymous from the merchant and others.</p> <p>Flexibility. A flexible payment system can be adapted for use under different conditions depending on technological, economic and geographical circumstances.</p> <p>Transferability. When funds can be received and spent again without the need to first deposit or clear the funds with a central entity, then value in the system is considered to be transferable.</p> <p>Convertibility. This refers to the ability to use funds from one payment system to transact in another.</p> <p>Efficiency. One aspect of payment efficiency relates to the ability of the payment system to service small payments or micro-payments without performance degradation or posing high transaction costs. Another aspect of efficiency concerns the processing of payments in real-time.</p> <p>Ease of Use. Usability relates to the ease with which the system can be used and the absence of complex procedural requirements before, during and after the processing of the transaction.</p> <p>Trust. Trust, with respect to payment systems, can be viewed from three perspectives, namely, trust in the means of payment; trust in the payment instruments, and trust in the environment in which the payment instrument is used.</p> <p>Relative Price Advantage. This represents the savings a payment product has over its alternatives. There are fixed and variable transaction costs that have to be borne by the merchant and similarly, in some cases, by the customer.</p> <p>Exitability/Reversibility. This refers to the option provided by the payment system to allow a user to suspend a payment instruction at various stages of the payment process and/or to reverse or cancel the complete transaction with relative ease and no financial consequences.</p> <p>Person-to-Person (P2P). P2P schemes allow for money transfers from one person to another particularly in cases where a customer has no access to credit card or bank account facilities.</p> <p>Cross-border Payment. The capability of a payment system to conduct cross-border or international payment transactions.</p> <p>Traceability. This refers to the monitoring of transaction activities and the ability to use the system to trace money flows to their source.</p> <p>Scalability. A payment system that scales effectively can handle a large number of customer transactions without degrading performance or coming to an abrupt halt.</p> <p>Divisibility. This is a characteristic that enables a payment amount to be spent in any combination of payments.</p> <p>Atomicity. When a technical defect occurs during the processing of a payment transaction, the transaction must not be completed from either side.</p> <p>Ease of integration. This refers to the ease with which payment systems can be integrated into the back-end accounting systems of merchants. From the customer's perspective integration entails the ability to use different payment instruments seamlessly to manage their payments with existing accounts.</p> <p>Relative feature advantage. This represents the added functionality provided by the payment system when compared to others in the same class, for example shorter float, support for multi-currencies and ability to handle different transaction sizes.</p> <p>Risk Management. The uncertainty concerning payment systems stems from the financial, operational, reputational and legal risks that customers, merchants and other stakeholders are likely to encounter. Risk management refers to the ability of a payment system to support the mitigation of the risks that arise from loss of money, deficiencies in systems reliability and integrity, damage to reputations and violations of, or non-conformance with laws, rules, regulations, or prescribed practices.</p> <p>Interoperability. This refers to the capability of a payment system to run transparently on a variety of hardware configurations and on different software systems within the context of an industry-wide set of standards and protocols.</p> <p>Incentives. Incentives such as payment guarantees, limited fraud liability and reduced liability for chargebacks can be offered to allay customers' and merchants' fears, and thereby encouraging usage.</p> <p>Market Presence. This represents the extent to which customers and merchants are aware of the existence of the payment option and/or the benefits that it offers.</p> <p>Market Reach. Market reach represents the merchant's perception of the number of customers using the product. It is closely associated with the impact of network externalities and critical mass.</p> <p>Rules, Regulations & Policies. This refers to the legal frameworks, practice guidelines, procedures and mechanisms needed to support new, innovative payment instruments that are not catered for by the rules and regulations established for traditional payment systems.</p>
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Table 2: Attributes and characteristics of Internet Payments System

Attribute	References	Major Focus on
User Related		
Security (Authentication, Integrity, Non-repudiation, Fraud susceptibility)	[22]; [18]; [17]; [19]; [20]	Consumer/ Merchant
Reliability (and Availability)	[22]; [18]; [19]; [20]	Consumer/ Merchant
Anonymity	[22]; [18]; [17]	Consumer
Flexibility, Applicability & Acceptability	[22]; [17]; [19]; [20]; [23]; [24]	Consumer/ Merchant
Transferability	[25]; [26]	Consumer/ Merchant
Convertibility	[18]; [19]	Consumer/ Merchant
Efficiency	[22]; [18]; [19]; [20]	Consumer/ Merchant
Ease of use / Usability	[22]; [18]; [27]; [28]; [17]; [19]; [20]	Consumer
Trust	[18]; [27]; [23]; [28]; [19]; [20]; [24]	Consumer/ Merchant
Relative Price Advantage (Transaction Costs (fixed, variable, buyer), Cost of ownership)	[29]; [27]; [30]; [31]; [32]; [17]	Consumer/ Merchant
Exitability/ Reversibility / Payment Cancellation	[22]	Consumer
Person to Person (P2P)	[6]	Consumer
Cross-border payment capability	[33]	Consumer/ Merchant
Traceability	[18]; [19]; [20]	Consumer
Technology Related		
Scalability	[22]; [18]; [34]	Merchant
Divisibility	[18]; [34]	Consumer
Atomicity	[35]	Customer/ Merchant
Ease of integration with applications	[22]	Merchant
Relative Feature Advantage (Float, multicurrency, payment size)	[18]; [36]; [29]; [27]; [37]; [23]; [30]; [28]; [17]	Consumer/ Merchant
Risk Management		Customer/ Merchant
Interoperability	[18]	Consumer/ Merchant
Legal & Market Related		
Incentives	[23]	Consumer/ Merchant
Market Presence	[18]; [38]; [29]; [37]; [23]; [28]; [16]	Consumer/ Merchant
Market Reach (Customer Base, Network Effects)	[22]; [38]; [29]; [17]; [18]	Consumer/ Merchant
Rules, Regulations & Policies	[39]; [40]; [41]; [42]; [36]	Consumer/ Merchant

In order to assist in evaluating a payment system in a comparative analysis, six salient attributes have been identified as encompassing the majority of the characteristics of payment systems described above. These attributes and definitions were arrived at from focus group meetings, interviews with payment system providers and analysis of payment product offerings. The final list comprised:

- **Confidence:** A term used in this study to describe the users' belief that a payment system can be trusted to successfully and reliably execute and complete a payment, and that there are adequate rules and regulations to oversee all the steps in the process to minimise non-repudiation and likelihood of fraud and other security breaches.
- **Confidentiality:** A term used in this study to describe the integrity of the payment system in maintaining the security and privacy of users' information through adequate authentication mechanisms.
- **Convenience:** A term used in this study to describe the ease of use of a payment method and the availability of useful payment features and functionalities.
- **Cost:** A term used in this study to describe the cost of the payment system to users via transactional charges and savings derived from payment efficiencies, financial incentives, etc.
- **Coverage:** A term used in this study to describe how widely a payment system is accepted by merchants and customers and the level of its awareness amongst the population.
- **Control:** A term used in this study to describe the extent to which the user is able to control, monitor and regulate the payment process.

The next step in the process was to obtain agreement on the most appropriate salient attribute to associate with the ones derived from the literature survey. A simplified Delphi procedure was conducted with a group of payment service providers to help classify and

consolidate these attributes into the derived group of salient attributes.

5. Categorization and Classification of Attributes

A panel of eight payment experts and individuals with first-hand experience or interest in and knowledge of the field was set up. The final composition was made up of three payment service providers, an academic, two consultants and two merchants. Communication was via e-mail and telephone conversations. Each was provided a grid comprising the salient attributes and their definitions, and the three categories of factors (user, technology, and legal and market-related) together with a list of the attributes derived from the literature review. The experts were then asked to place each attribute into the cell which, in their opinion, most closely matched the category and salient attribute. The responses were consolidated and in the cases where there were differing opinions the panel members were asked to justify their position. These exceptions were sent back to the panel with a view to obtaining consensus. Where these could not be reached a final decision as to where to place the attribute was made by the authors based on the strength of the justification. The final results are set out in Table 3.

6. Future Research

The value that an adopter places on the characteristics and attributes of an innovation will be determined by the nature of the potential adopter (merchant and customer) and when and how much the adopter learns about the innovation.

The results of this study are to be used towards a larger study on the adoption of alternate payment systems. The salient attributes will be used to determine the extent of the influence they have on these systems and their mediating effects on a variety of external factors that are likely to impact on user payment preferences and perceptions.

The hypotheses here are that the perceptions of these attributes will predict the rate at which and innovation is adopted, and that perceptions of these attribute levels will change as external factors change. These changes in beliefs about the attribute levels in turn should influence the probability of adoption. The salient attributes have been incorporated in a quantitative study targeted towards Internet and non-Internet users (see Appendix A for a sample of the questionnaire).

Table 3: Salient IPS Attributes and encompassing factors

Salient Internet Payment Systems Attributes	User Related factors	Technology Related factors	Legal & Market Related factors
Confidence: A term used in this study to describe the users' belief that a payment system can be trusted to successfully and reliably execute and complete a payment, and that there are adequate rules and regulations to oversee the all the steps in the process to minimise non-repudiation and likelihood of fraud and other security breaches.	<ul style="list-style-type: none"> Reliability Availability Trust 	<ul style="list-style-type: none"> Atomicity Non-repudiation 	<ul style="list-style-type: none"> Rules, regulations and public policies Fraud susceptibility
Confidentiality: A term used in this study to describe the integrity of the payment system in maintaining the security and privacy of users' information through adequate authentication mechanisms.	<ul style="list-style-type: none"> Anonymity Traceability 	<ul style="list-style-type: none"> Authentication Integrity Privacy 	
Convenience: A term used in this study to describe the ease of use of a payment method.	<ul style="list-style-type: none"> Flexibility Applicability Ease of use Speed Convertibility Transferability Person-to-person 	<ul style="list-style-type: none"> Divisibility Ease of integration 	<ul style="list-style-type: none"> Interoperability Multicurrency Float
Cost: A term used in this study to describe the cost of the payment system to users via transactional charges and savings derived from payment efficiencies etc.	<ul style="list-style-type: none"> Transaction costs (fixed and variable) Cost of ownership Cost effectiveness Payment efficiencies Float 	<ul style="list-style-type: none"> Scalability 	<ul style="list-style-type: none"> Financial incentives Payment size
Coverage: A term used in this study to describe how widely a payment system is accepted by merchants and customers.	<ul style="list-style-type: none"> Cross-border capability Acceptability 		<ul style="list-style-type: none"> Market reach Market presence
Control: A term used in this study to describe the extent to which the user is able to control, monitor and regulate the payment process.	<ul style="list-style-type: none"> Payment cancellation Transaction reversibility Exitability 	<ul style="list-style-type: none"> Risk and fraud management 	

7. Conclusion

The above discussion makes it clear that questions about payment systems are complex. They involve a significant number of interrelated issues associated with commercial relationships, technology, the law, and business practices, and involve coordination among a variety of parties with different and sometimes competing interests [37]. For these reasons there have been a variety of payment products on the market in recent years each providing different tradeoffs with respect to the characteristics described above.

Adding to the complexity of these relationships, payment systems involve long-term infrastructure investments, which evolve slowly over time. As a result, it is critical to evaluate payment systems changes in a broader context, which recognizes the various component factors, including the nature of the commercial relationship as well as the nature of the payment systems used.

The unique attributes and characteristics of Internet Payment Systems and their increasingly important influence to the ongoing success of e-Commerce therefore merit particular attention. This research acknowledges the necessity for a classification of attributes which will enable clear distinctions to be made between more complex, multi-participant interactive payment systems.

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